QUALITY CONTROL OF RASTER-SCANNED SETS OF IMAGE DATA

The invention pertains to a method for the quality control of scanned image data, in which output-relevant quality parameters going beyond resolution and image size are checked on the basis of the set of scanned digital data.

Many checking means and methods have been developed to check and to guarantee the quality of the output of raster-scanned image data on suitable output machines. As a rule, this checking procedure is carried out after the completion of the output on, for example, an image setter or CTP system and is based on the evaluation of control elements which are output jointly with the image data. These control elements can be evaluated visually or automatically.

This approach suffers from many disadvantages in practice. A key problem is that any existing defects which are based on the nature of the scanned image data itself are often not detected until after the data has been output. When this occurs, the costs which result when defective scanned image data are printed out must always be paid. In the previous example of the output of a digitally imaged printing plate on a CTP system, these costs cover the consumable materials used, including the cost of the digitally imaged printing plate, which is not usable as such and which must be reimaged with appropriate corrected image data, plus the cost of using the production machines and the cost of labor.

Output machines, furthermore, which do not allow proofing to be carried out easily after the output is complete are becoming increasingly more important. To be named in this

context are the imaging systems which are integrated into digital offset printing presses. Because in such cases the prepared printing form is difficult to access, quality control after the output, in this case, after the imaging of the printing form, is possible only with considerable effort.

Another disadvantage is that the cost of quality control by visual or automatic evaluation of control elements cannot usually be charged separately. In the practical case of a service provider who carries out exposure orders for his customers in the form of output on image setters or CTP systems, this quality inspection must be done at his own cost to protect himself from any possible claims for compensation if some of the exposures turn out to be defective.

Also disadvantageous is the large number of manual work steps associated with quality evaluation based on control means which are output concomitantly with the image data. The error rate of such manual quality evaluation is correspondingly high, which means that, in practice, many quality defects remain undiscovered, and this leads in turn to considerable costs over the further course of production.

The task of the invention is to provide a method which makes it possible to evaluate and to control, accurately and objectively, output-specific quality parameters of scanned image data, which method also guarantees that quality defects which are based on the nature of the scanned image data can be reliably detected before the output of the data.

The task is accomplished according to the invention in that output-relevant quality parameters of the scanned image data are checked by an evaluation unit, and in that deviations from the reference variables in question are determined.

The invention thus provides a method which guarantees an objective evaluation of the

checked quality parameters and which can be conducted automatically for the most part, as a result of which the error rate is minimized and the costs of manual labor and manual interventions are avoided.

As desired, individual areas or the entire set of scanned image data can be subjected to the quality evaluation.

It is effective to conduct the quality evaluation on a computerized basis with the help of suitable software.

In particular, the quality parameters which should be proofed and evaluated include the screen frequency, the screen angle, the area coverage, the shape of the screen dot, spreading/overprinting, total ink application, the color space used, Moiré, minimum and maximum area coverage, smallest dot size in the light, smallest open dot in the depth dimension, and the screen type.

The quality evaluation unit analyzes the pixel within the read-in image section representing the object of the quality evaluation. For example, an analysis of the distance between the individual screen dots makes it possible to determine the screen frequency.

The screen angle can be derived from the position of the screen dots with respect to a zero direction, whereas information on the shape of the dots being used can be obtained from an analysis of the edges of the individual dots.

Various output-relevant quality parameters, furthermore, require a comparative examination of more than one set of scanned image data. Thus an evaluation of the selected spreading parameters requires a combined study of several of the separations required for printing the sheet in question.

In this context, the spreading can be determined, for example, on the basis of the

overlap of the color separations.

Especially important in conjunction with scanned data sets is the quality parameter known as Moiré.

An automated checking of this quality parameter on the basis of, for example, an evaluation of the periodic changes in the area coverage within the scanned image data sets can ensure here the necessary production quality.

The values of the output-relevant quality parameters determined by the evaluation unit are compared with values of corresponding reference parameters and evaluated on that basis.

If at least one determined result of the evaluation of an output-relevant quality parameter deviates from the value of the reference parameter beyond a certain limit, also stored in memory, it is advisable for an appropriate signal to be transmitted and for a suitable process of error handling to be initiated.

This can consist, for example, of a generated warning or of the blocking of the output of the run in question on the selected output machine.

The invention is to be explained in greater detail below on the basis of an exemplary embodiment with reference to the single figure.

The example pertains to the use of the invention in conjunction with a digital offset printing press, in which the imaging of the printing form is performed in the printing press itself.

In the prepress phase (1), a Postscript RIP (2) generates scanned image data (3) and makes them available for the next step. These data are stored initially as 1-bit TIFF files in a local image memory unit (4), i.e., on the hard drive of the RIP system.

The scanned image data set (3) contains a control wedge (5) in a defined area; this

control wedge is inserted before the calculation of the scanned image data by the Postscript RIP and has defined tone values in defined fields.

From the local image data memory (4) of the RIP system (2), the scanned image data in 1-bit TIFF format are now to be transferred to an internal image data memory (6) in the digital offset printing press (7), where they will available to the imaging unit (8) in the printing press for producing the printing form.

Before this transfer takes place, the evaluation unit (9) first reads in the area of the scanned image data set (3) which contains the inserted control element. Then the evaluation unit (9) analyzes the individual fields of the control wedge (5), thus determining the area coverage and the screen frequency. These values are compared with the values of reference parameters, which, together with appropriate limit values, have been stored in a database (10) specifically for the customer order in question.

If a measurement exceeds the limit value, an appropriate signal is generated; an error message is sent; and the transfer of the scanned image data set is not accepted or is not conducted.

If none of the measurements exceeds the limit value, the checked set of scanned image data is sent to the internal image data memory (6) of the digital offset printing press (7).